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Comparing cadmium removal efficiency of a magnetized biochar based on orange peel with those of conventional orange peel and unmodified biochar

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ABSTRACT

The objective of this study was to investigate the influence of several factors in adsorption of cadmium ions on an advantageous novel low-cost sorbent synthesized from orange peel, nano iron oxide-modified orange peel biochar (IOM-OPB). The adsorption efficiency of IOM-OPB was compared with those of conventional orange peel (OP) and orange peel biochar (OPB). To find the optimum conditions that would give the highest removal efficiency, the effects of several physiochemical factors such as contact time, pH and initial concentration were tested using batch adsorption in a step by step procedure and factorial design. Main effects and interaction effects of three factors were analyzed by using statistical software MINITAB-Version 16. The results indicated that a maximum adsorbent capacity of IOM-OPB was higher than those of OP, OPB. Also, although the type of adsorbent, initial cadmium concentration and pH affect on the removal process, the adsorbent type has the biggest effect on the cadmium adsorption. The results of kinetic, equilibrium and thermodynamic experiments indicated that adsorption process of cadmium onto IOM-OPB is more favorable than onto OP and OPB. Overall, the obtained results showed that IOM-OPB is promising advantageous low-cost adsorbent which can be applied in the real treatment plants.

Keywords: Orange peel; Iron oxide nanoparticle; Cadmium; Adsorption; Biochar

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